AMENDMENTS TO THE CLAIMS

Claims 1-42 (Canceled)

Claim 43 (New) A rotation stabilizing device in a microgravitational rotating apparatus, wherein:

said microgravitational rotating apparatus comprises a casing, a rotary shaft provided within said casing and having two ends that are both supported by bearings so as to be rotationally driven by a motor, and a plurality of radially extending arms having first ends fitted and supported to said rotary shaft and other ends fitted with a plurality of boxes for having objects having weight placed therein; and

said rotation stabilizing device comprises a means for stabilizing rotation provided at a location selected from the group consisting of between said casing and said plurality of boxes, between an outer side of said casing and stationary structure, and between said rotary shaft and said plurality of arms.

Claim 44 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a flat plate ring shape;

wherein said fin is fixed to outer circumferential surfaces of said plurality of boxes so as to extend orthogonally to said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap

sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 45 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a frustoconical ring shape with a conical surface inclined with a predetermined angle to said rotary shaft;

wherein said fin is fixed to outer circumferential surfaces of said plurality of boxes;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 46 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a cylindrical shape fixed to each of upper and lower surfaces of said plurality of boxes so as to extend in the same direction as said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 47 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a flat plate ring shape;

wherein said fin is fixed to outer circumferential surfaces of said plurality of boxes so as to extend orthogonally to said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a pair of cylinders fixed to said casing and connected to said electromagnetic coils of said pair so that said electromagnetic coils can be moved and the gap changed;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control drive of said pair of cylinders of said pair of electromagnetic coils which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 48 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a frustoconical ring shape with a conical surface inclined with a predetermined angle to said rotary shaft;

wherein said fin is fixed to outer circumferential surfaces of said plurality of boxes;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a pair of cylinders fixed to said casing and connected to said electromagnetic coils of said pair so that said electromagnetic coils can be moved and the gap changed;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control drive of said pair of cylinders of said pair of electromagnetic coils which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 49 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a cylindrical shape fixed to each of upper and lower surfaces of said plurality of boxes so as to extend in the same direction as said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to a wall surface of said casing at each of a plurality of places along a circumferential periphery of said fin so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a pair of cylinders fixed to said casing and connected to said electromagnetic coils of said pair so that said electromagnetic coils can be moved and the gap changed;

a gap sensor, operable to detect variations in the gap, fitted to said wall surface of said casing adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control drive of said pair of cylinders of said pair of electromagnetic coils which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 50 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a flat plate ring shape;

wherein said fin is fixed to inner circumferential wall surface of said casing so as to extend orthogonally to said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to an outer circumferential surface of each of said plurality of boxes so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said outer circumferential surface of each of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 51 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a frustoconical ring shape with a conical surface inclined with a predetermined angle to said rotary shaft;

wherein said fin is fixed to inner circumferential wall surface of said casing;

a pair of electromagnetic coils, facing each other, fitted to an outer circumferential surface of each of said plurality of boxes so that said fin may be interposed between said electromagnetic coils

of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said outer circumferential surface of each of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 52 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a cylindrical shape fixed to each of upper and lower inner wall surfaces of said casing so as to extend in the same direction as said rotary shaft;

a pair of electromagnetic coils, facing each other, fitted to each of upper and lower surfaces of said plurality of boxes so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair;

a gap sensor, operable to detect variations in the gap, fitted to said upper and lower surfaces of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control an excitation current of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 53 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a flat plate ring shape;

wherein said fin is fixed to inner circumferential wall surface of said casing so as to extend orthogonally to said rotary shaft;

a pair of cylinders, facing each other, fitted to each of outer circumferential surfaces of said plurality of boxes;

a pair of electromagnetic coils, facing each other, connected to said cylinders of said pair of cylinders so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair and so that the gap is adjustable;

a gap sensor, operable to detect variations in the gap, fitted to said outer circumferential surface of each of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control said cylinders of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 54 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a frustoconical ring shape with a conical surface inclined with a predetermined angle to said rotary shaft;

wherein said fin is fixed to inner circumferential wall surface of said casing;

a pair of cylinders, facing each other, fitted to each of outer circumferential surfaces of said plurality of boxes;

a pair of electromagnetic coils, facing each other, connected to said cylinders of said pair of cylinders so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair and so that the gap is adjustable;

a gap sensor, operable to detect variations in the gap, fitted to said outer circumferential surface of each of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control said cylinders of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 55 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises:

a fin having a cylindrical shape fixed to each of upper and lower surfaces of said casing so as to extend in the same direction as said rotary shaft;

a pair of cylinders, facing each other, fitted to each of upper and lower surfaces of said plurality of boxes;

a pair of electromagnetic coils, facing each other, connected to said cylinders of said pair of cylinders so that said fin may be interposed between said electromagnetic coils of said pair with a predetermined gap being maintained between said fin and said electromagnetic coils of said pair and so that the gap is adjustable;

a gap sensor, operable to detect variations in the gap, fitted to each of said upper and lower surfaces of said plurality of boxes adjacent said electromagnetic coils of said pair; and

a control unit operable to receive detected signals of said gap sensor, compare the signals with a set value, and control said cylinders of said electromagnetic coils of said pair which said gap sensor is adjacent to when the detected signals are in excess of said set value so that said gap can be adjusted to fall within the set value.

Claim 56 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises a vibration isolating device that supports said casing at each of a plurality of places on an outer peripheral portion of said casing, said vibration isolating device comprising a spring mechanism elastically supporting said casing on said stationary structure and an electromagnetically supporting mechanism comprising an excitation coil connected to said spring mechanism so as to

electromagnetically support said spring mechanism with respect to said stationary structure by excitation of said excitation coil.

Claim 57 (New) The rotation stabilizing device of claim 56, wherein said vibration isolating device further comprises a gap sensor operable to detect a gap between said casing and said stationary structure and a control unit operable to received detected signals of said gap sensor and, when the detected signals indicate a gap in excess of a predetermined range, to control an excitation current of said excitation coil so as to reduce vibration.

Claim 58 (New) The rotation stabilizing device of claim 56, wherein said vibration isolating device further comprises a gap sensor operable to detect a gap between said casing and said stationary structure and a control unit operable to received detected signals of said gap sensor, to detect signal variations and to output drive signals to cancel the signal variations so that excitation current of said excitation coil is controlled by the drive signals to reduce vibration.

Claim 59 (New) The rotation stabilizing device of claim 56, wherein:

said spring mechanism comprises a casing frame member fitted to said casing, a stationary structure frame member fitted to said stationary structure and a spring connecting said casing frame member and said stationary structure frame member; and

said electromagnetically supporting mechanism comprises an excitation coil, said casing frame member comprising said excitation coil, and a conductor fitted with said stationary structure frame member;

wherein said conductor is inserted into said casing frame member with a predetermined gap between said conductor and said casing frame member.

Claim 60 (New) The rotation stabilizing device of claim 59, wherein said spring mechanism comprises one or more bar-like rod springs.

Claim 61 (New) The rotation stabilizing device of claim 59, wherein said spring mechanism comprises one or more bar-like coil springs.

Claim 62 (New) The rotation stabilizing device of claim 59, wherein said spring mechanism comprises one or more members made of rubber, plastics, etc. having a predetermined elasticity.

Claim 63 (New) The rotation stabilizing device of claim 56, wherein said spring mechanism comprises one or more bar-like rod springs.

Claim 64 (New) The rotation stabilizing device of claim 56, wherein said spring mechanism comprises one or more bar-like coil springs.

Claim 65 (New) The rotation stabilizing device of claim 56, wherein said spring mechanism comprises one or more members made of rubber, plastics, etc. having a predetermined elasticity.

Claim 66 (New) The rotation stabilizing device of claim 43, wherein said means for stabilizing rotation comprises a safety device interposed between said rotary shaft and said plurality of arms operable to disconnect said rotary shaft and said plurality of arms from each other if said rotary shaft stops suddenly so that said plurality of arms can rotate freely with respect to said rotary shaft.

Claim 67 (New) The rotation stabilizing device of claim 66, wherein said safety device comprises:

an actuator fitted within each of said plurality of arms;

a pin, fitted to an end of a rod of each said actuator, which can engage with a pin hole in said rotary shaft; and

a sensor operable to detect rotation of said rotary shaft and provide a rotation signal;

wherein said rod can be extended to cause said pin at said end of said rod to engage with said pin hole so that said plurality of arms are rotatable together with said rotary shaft and said rod can

be retracted if said rotary shaft stops suddenly based on the rotation signal from said sensor so as to disengage said pin from said pin hole.

Claim 68 (New) The rotation stabilizing device of claim 66, wherein:

said plurality of arms are radially fixed to a connecting shaft;

said rotary shaft comprises a separate upper rotary shaft and a lower rotary shaft with said connecting shaft interposed there between;

an actuator is fitted within each of said upper and lower rotary shafts;

a pin is fitted to an end of a rod of each said actuator such that said pin can engage with a corresponding pin hole in said connecting shaft;

a sensor is operable to detect rotation of said rotary shaft and to provide a rotation signal; and

said rod can be extended to cause said pin at said end of said rod to engage with said pin hole so that said connecting shaft is rotatable together with said rotary shaft and said rod can be retracted if said rotary shaft stops suddenly based on the rotation signal from said sensor so as to disengage said pin from said pin hole.

Claim 69 (New) The rotation stabilizing device of claim 66, wherein said safety device comprises:

an actuator, having a rod with an end formed in a round shape, fitted within each of said plurality of arms;

a sensor operable to detect rotation of said rotary shaft; and

an abutting portion, having a recessed round shape complementary to the round shape of said end of said rod of said actuator, provided in said rotary shaft so that said end of said rod of said actuator can be moved to abut on said abutting portion;

wherein said rod can be extended to cause said end of said rod to abut on said abutting portion of said rotary shaft so that said plurality of arms become rotatable together with said rotary shaft and can be retracted if said rotary shaft stops suddenly, based on a signal from said sensor, to disengage said end of said rod from said abutting portion.

Claim 70 (New) The rotation stabilizing device of claim 66, wherein said safety device comprises:

a hole in each of said plurality of arms opening at an end face thereof;

a spring provided at a bottom of said hole;

a claw member having one end activated by said spring and an other end projecting outside of said hole; and

an abutting portion having a recessed shape complementary to a shape of said other end of said claw member, said abutting portion being provided in said rotary shaft so that said other end of said claw member, activated by said spring, can abut on said abutting portion of said rotary shaft so that said plurality of arms are rotatable together with said rotary shaft and so that if said rotary shaft stops suddenly, said plurality of arms, together with said claw member, continue to rotate by force of inertia so as to make said claw member disengage from said abutting portion of said rotary shaft and so that said plurality of arms are rotatable freely with respect to said rotary shaft.

Claim 71 (New) A rotation stabilizing device in a microgravitational rotating apparatus, wherein:

said microgravitational rotating apparatus comprises a casing, a rotary shaft provided within said casing and having two ends that are both supported by bearings so as to be rotationally driven by a motor, and a plurality of radially extending arms having first ends fitted and supported to said rotary shaft and other ends fitted with a plurality of boxes for having objects having weight placed therein; and

a vibration isolating device for stabilizing rotation provided between an outer side of said casing and stationary structure, said vibration isolating device supporting said casing at each of a plurality of places on an outer peripheral portion of said casing and comprising:

a spring mechanism elastically supporting said casing on said stationary structure, and

an electromagnetically supporting mechanism comprising an excitation coil connected to said spring mechanism so as to electromagnetically support said spring mechanism with respect to said stationary structure by excitation of said excitation coil;

wherein said spring mechanism comprises one or more selected from the group consisting of bar-like rod springs, bar-like coil springs, and members made of rubber, plastics, etc. having a predetermined elasticity.

Claim 72 (New) A rotation stabilizing device in a microgravitational rotating apparatus, wherein:

said microgravitational rotating apparatus comprises a casing, a rotary shaft provided within said casing and having two ends that are both supported by bearings so as to be rotationally driven by a motor, and a plurality of radially extending arms having first ends fitted and supported to said rotary shaft and other ends fitted with a plurality of boxes for having objects having weight placed therein; and

a vibration isolating device for stabilizing rotation provided between an outer side of said casing and stationary structure, said vibration isolating device supporting said casing at each of a plurality of places on an outer peripheral portion of said casing and comprising:

a spring mechanism elastically supporting said casing on said stationary structure, and

an electromagnetically supporting mechanism comprising an excitation coil connected to said spring mechanism so as to electromagnetically support said spring mechanism with respect to said stationary structure by excitation of said excitation coil.